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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/762,676	01/22/2004	Yosuke Inomata	81872.0055	5144

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EXAMINER

CHEN, ERIC BRICE

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 02/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/762,676

Applicant(s)

INOMATA, YOSUKE

Examiner

Eric B. Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 November 2005.
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
4a) Of the above claim(s) 5-6 and 14-15 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-4 and 7-13 is/are rejected.
7) ☒ Claim(s) 1, 10 and 13 is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 1/22/04.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Invention I (claims 1-4) in the reply filed on Nov. 18, 2005 is acknowledged.
2. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-4 and 7-13, drawn to a substrate, classified in class 428, subclass 620.
 - III. Claims 14 and 15, drawn to a solar cell, classified in class 257, subclass E31.13.
3. Newly submitted claims 14 and 15, directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: Inventions I and III are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case, a multicrystalline silicon substrate with fine and large texturing has other applications unrelated to solar cells (i.e., a retroreflective surface); solar cells can be fabricated with materials other than multicrystalline silicon.
4. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper. Moreover, the

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inventions have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

5. The newly added claims (claims 7-13) that depend on the originally elected Invention I (claims 1-4) will be examined. Claims 14 and 15 are withdrawn from consideration as being directed to a non-elected invention.

Priority

6. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Objections

7. Claims 1 and 10 are objected to because of the following informalities: apparently "on" should be -- over -- (i.e., fine textures formed *on* the relatively large irregularities), as shown in Figure 6. Appropriate correction is required.

8. Claim 13 should apparently be dependent on claim 10, instead of claim 9. Otherwise, "the fine textures" would lack the proper antecedent basis. Appropriate correction is required.

Claim Rejections - 35 USC § 112

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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10. Claims 1-4 and 7-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

11. The terms "relatively large" and "relatively fine" in claim 1 is a relative term which renders the claim indefinite. The terms "relatively large" and "relatively fine" are not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

12. The term "relatively large" in claim 9 is a relative term which renders the claim indefinite. The term "relatively large" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

13. Claims 2-4 and 7-8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite because they are dependent on indefinite base claim 1.

14. Claims 10-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite because they are dependent on indefinite base claim 9.

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

16. Claims 9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishimoto et al. (U.S. Patent No. 6,156,968).

17. As to claim 9, Nishimoto discloses a multicrystalline silicon substrate comprising: a substrate of multicrystalline silicon (column 6, lines 31-34) having relatively large irregularities formed on a surface thereof (column 5, lines 66-67; column 6, lines 1-4; Figures 2 and 8).

18. Nishimoto does not expressly disclose a surface area-to-planar surface area ratio R of the substrate being larger than 1 and smaller than 1.1. However, Nishimoto discloses that the reflectivity of the surface is controlled by the geometry of the irregularities (column 11, lines 17-39; Figure 10). In doing so, Nishimoto teaches that the geometry of the irregularities is a results-effective variable. See MPEP § 2144.05 (II). Geometry of the irregularities, including surface area-to-planar surface area ratio, can be varied according, depending on the desired outcome of an etching step, such as control over reflectivity. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a surface with area-to-planar surface area ratio R of the substrate being larger than 1 and smaller than 1.1. One who is skilled in the art would be motivated to optimize through routine experimentation of the geometry of the irregularities. See MPEP § 2144.05 (II).

19. As to claim 12, Nishimoto discloses that the relatively large irregularities are formed are formed by etching with an alkaline (column 6, lines 51-53).

Allowable Subject Matter

20. Claims 1-4 and 7-8 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action.

21. The following is a statement of reasons for the indication of allowable subject matter: the prior art fails to teach or suggest a multiplicity of fine structures formed on the large irregularities (as in Applicants' Figure 6), in the context of claim 1. The closest prior art, Nishimoto, discloses forming only large irregularities on the multicrystalline silicon substrate. However, there no motivation or suggestion of a multiplicity of fine structures formed on the large irregularities.

22. Claims 10-12 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims. Claim 13 would be allowable if rewritten to overcome the objection forth in this Office action.

23. The following is a statement of reasons for the indication of allowable subject matter: the prior art fails to teach or suggest a multiplicity of fine structures formed on the large irregularities (as in Applicants' Figure 6), as discussed above.

Conclusion

24. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hansen et al. (U.S. Patent No. 4,229,233) discloses reactive ion etching of silicon to reduce reflectivity. Park et al. (U.S. Patent No. 6,663,944) discloses

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texturing the surface of silicon with isotropic etching. Nakai et al. (U.S. Patent No. 6,207,890) discloses texturing polycrystalline silicon with wet isotropic etching.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B. Chen whose telephone number is (571) 272-2947. The examiner can normally be reached on Monday through Friday, 8AM to 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

EBC
Feb. 2, 2006

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER

